CLAIMS

1. A printing plate material comprising a substrate on the surface of which a coat layer containing a titanium oxide photocatalyst and a metal other than titanium is formed directly or with an intermediate layer intervening between the substrate and the coat layer.

2. The printing plate material as claimed in claim 1, wherein the metal other than titanium is at least one member selected from the group consisting of Fe^{2+}, Ni^{2+}, Mn^{2+}, Cr^{3+}, and Cu^{2+}.

3. The printing plate material as claimed in claim 2, wherein said at least one member selected from the group consisting of Fe^{2+}, Ni^{2+}, Mn^{2+}, Cr^{3+}, and Cu^{2+} is contained as an oxide.

4. The printing plate material as claimed in claim 3, wherein the oxide is a compound oxide with titanium.

5. The printing plate material as claimed in claim 1, wherein said metal other than titanium is a group VIa or IVb metal or an oxide thereof.

6. The printing plate material as claimed in claim 5, wherein said group VIa metal is any of W, Mo, and Cr.

7. The printing plate material as claimed in claim 5, wherein said group IVb metal is any of Ge, Sn, and Pb.

8. The printing plate material as claimed in ~~any of claims 1 to 7~~ claim 1, wherein the surface of said coat layer has hydrophobicity in terms of a water contact angle of at least 50° in its initial state.

9. The printing plate material as claimed in ~~any of claims 1 to 7~~ claim 1, wherein the surface of said coat layer is converted to a hydrophilic surface having a water contact angle of 10° or less by irradiation with light having a wavelength at an energy level higher than a band gap energy level of the titanium oxide photocatalyst.

10. The printing plate material as claimed in ~~any of claims 1 to 7~~ claim 1, wherein the surface of said coat layer has hydrophobicity in terms of a water contact angle of at least 50° in its initial state and is converted to a hydrophilic surface having a water contact angle of 10° or less by irradiation with light having a wavelength at an energy level higher than a band gap energy level of the titanium oxide photocatalyst.

11. The printing plate material as claimed in claim ~~10~~ 6, wherein the hydrophilic surface serves as a non-printing image

portion and the remaining hydrophobic surface serves as a printing image portion.

~~12.~~ 8 The printing plate material as claimed in claim ~~10 or 11~~ 6, which requires an energy of 0.005 to 2 J/cm^2 for converting the hydrophobicity of the surface of the coat layer to hydrophilicity, and on which an image can be directly formed based on digital data.

13. The printing plate material as claimed in ~~any of claims 1 to 12~~ claim 1, wherein the surface of said coat layer being hydrophilic in at least a portion thereof is reconverted to a hydrophobic surface having a water contact angle of at least 50° by irradiation with a flux of energy thereon.

14. The printing plate material as claimed in ~~any of claims 1 to 12~~ claim 1, wherein the surface of the coat layer being hydrophilic in at least a portion thereof is reconverted to a hydrophobic surface having a water contact angle of at least 50° by a chemical conversion treatment thereon.

15. The printing plate material as claimed in ~~any of claims 1 to 12~~ claim 1, wherein the surface of the coat layer being hydrophilic in at least a portion thereof is reconverted to a hydrophobic surface having a water contact angle of at least 50° by irradiation with a flux of energy thereon and by a chemical conversion treatment thereon.

16. The printing plate material as claimed in claim 1, wherein said coat layer has a surface at least a part of which forms a part converted to a hydrophilic surface by irradiation with light having a wavelength at an energy level higher than a band gap energy of titanium oxide catalyst and a hydrophobic part which is not irradiated with the light,

where the surface of the coat layer when subjected to light irradiation thereon and an electrochemical treatment thereon is hydrophobic.

17. The printing plate material as claimed in claim ~~16~~ 13, wherein the surface of said coat layer has hydrophobicity in terms of a water contact angle of at least 50° in its initial state.

18. The printing plate material as claimed in claim 16, wherein the surface of said coat layer is converted to a hydrophilic surface having a water contact angle of 10° or less by irradiation with light having a wavelength at an energy level higher than a band gap energy level of the titanium oxide photocatalyst.

19. The printing plate material as claimed in claim 16, wherein the surface of said coat layer has hydrophobicity in terms of a water contact angle of at least 50° in its initial state and is converted to a hydrophilic surface having a water

contact angle of 10° or less by irradiation with light having a wavelength at an energy level higher than a band gap energy level of the titanium oxide photocatalyst.

20. The printing plate material as claimed in claim ~~19~~, wherein the hydrophilic surface serves as a non-printing image portion and the remaining hydrophobic surface serves as a printing image portion.

21. The printing plate material as claimed in ~~any of claims 16 to 20~~ claim 16, wherein the surface of said coat layer being hydrophilic in at least a portion thereof is reconverted to a hydrophobic surface having a water contact angle of at least 50° by light irradiation thereon and an electrochemical treatment thereon.

22. The printing plate material as claimed in ~~any of claims 1 to 21~~ claim 1, wherein the surface of said coat layer being hydrophilic in at least a portion thereof is reconverted to a hydrophobic surface having a water contact angle of at least 50° by cleaning the surface and renewing the surface of the coat layer containing the titanium oxide catalyst to renew the catalyst.

23. The printing plate material as claimed in claim ~~22~~, wherein the cleaning is polishing cleaning.

24. The printing plate material as claimed in claim 18, which further comprises on said coat layer a coating layer comprising a compound which can be decomposed by irradiation with light having a wavelength at an energy level higher than a band gap energy level of the titanium oxide photocatalyst.

25. The printing plate material as claimed in claim 24, wherein said coat layer further contains at least one member selected from the group consisting of Fe^{2+}, Ni^{2+}, Mn^{2+}, Cr^{3+}, and Cu^{2+}.

26. The printing plate material as claimed in claim 25, wherein said at least one member selected from the group consisting of Fe^{2+}, Ni^{2+}, Mn^{2+}, Cr^{3+}, and Cu^{2+} is contained as an oxide.

27. The printing plate material as claimed in claim 26, wherein the oxide is a compound oxide with titanium.

28. The printing plate material as claimed in claim 24, wherein said metal other than titanium is a group VIa or IVb metal or an oxide thereof.

29. The printing plate material as claimed in claim 28, wherein said group VIa metal is any of W, Mo, and Cr.

30. The printing plate material as claimed in claim 28,

wherein said group IVb metal is any of Ge, Sn, and Pb.

31. The printing plate material as claimed in ~~any of claims 24 to 30~~ Claim 24, wherein the surface of said coat layer has hydrophobicity in terms of a water contact angle of at least 50° in its initial state.

32. The printing plate material as claimed in ~~any of claims 24 to 30~~ Claim 24, wherein the surface of said coat layer is exposed and is converted to a hydrophilic surface having a water contact angle of 10° or less by irradiation with the light.

33. The printing plate material as claimed in ~~any of claims 24 to 30~~ Claim 24, wherein the surface of said coat layer has hydrophobicity in terms of a water contact angle of at least 50° in its initial state and is converted to a hydrophilic surface having a water contact angle of 10° or less by irradiation with the light.

34. The printing plate material as claimed in claim 33, wherein the hydrophilic surface serves as a non-printing image portion and the remaining hydrophobic surface serves as a printing image portion.

35. The printing plate material as claimed in ~~any of claims 1 to 12~~ Claim 1, wherein the surface of said coat layer being hydrophilic in at least a portion thereof is reconverted to a

hydrophobic surface having a water contact angle of at least 50° by a reaction or strong interaction with a compound having an organic hydrophobic group in its molecule.

36. The printing plate material as claimed in claim 35, wherein said compound having an organic hydrophobic group in its molecule is decomposable by a titanium oxide photocatalytic action under irradiation with light having an energy higher than a band gap energy of the titanium oxide photocatalyst.

37. The printing plate material as claimed in claim 35 ~~or 36~~, wherein said compound having an organic hydrophobic group in its molecule is a fatty acid dextrin.

38. The printing plate material as claimed in claim 35 ~~or 36~~, wherein said compound having an organic hydrophobic group in its molecule is an organic titanium compound.

39. The printing plate material as claimed in claim 35 ~~or 36~~, wherein said compound having an organic hydrophobic group in its molecule is an organic silane compound.

40. The printing plate material as claimed in ~~any of claims~~ claim 1 ~~to 12~~, which can be repeatedly used by repeating the steps of:

preparing a printing plate in which a latent image, which comprises a hydrophobic portion which is not irradiated with

light and a portion which is irradiated with light to be changed to a hydrophilic surface, is formed by irradiating the printing plate material with light having an energy higher than a band gap energy of the titanium oxide photocatalyst, and

renewing the printing plate material by allowing at least the hydrophilic portion on the surface of the plate material to react or strongly interact with a compound having an organic hydrophobic group in its molecule after removing an ink from the surface of the printing plate material after completion of printing.

41. The printing plate material as claimed in ~~any of claims 1 to 40~~ Claim 1, on which an image can be written using a writing apparatus which comprises a light source for emitting light having an energy higher than a band gap energy of the titanium oxide photocatalyst, and which directly forms an image on the plate material based on digital data.

42. A method for renewing a printing plate material as claimed in claim 1 ~~or 16~~, the method comprising the steps of:

cleaning a surface of a coat layer containing a titanium oxide photocatalyst after completion of printing; and

then renewing the coat layer containing a titanium oxide photocatalyst.

43. A method for renewing a printing plate material as in the

printing plate material of claim 1, the method comprising the steps of:

cleaning a surface of a coat layer containing a titanium oxide photocatalyst after completion of printing; and

then renewing the coat layer containing a titanium oxide photocatalyst by irradiation with a flux of energy thereon.

44. A method for renewing a printing plate material as in the printing plate material of claim 1, the method comprising the steps of:

cleaning a surface of a coat layer containing a titanium oxide photocatalyst after completion of printing; and

then renewing the coat layer containing a titanium oxide photocatalyst by a chemical conversion treatment thereon.

45. A method for renewing a printing plate material as in the printing plate material of claim 1, the method comprising the steps of:

cleaning a surface of a coat layer containing a titanium oxide photocatalyst after completion of printing; and

then renewing the coat layer containing a titanium oxide photocatalyst by irradiation with a flux of energy thereon and a chemical conversion treatment thereon in combination.

46. A method for renewing a printing plate material as in the printing plate material of claim 16, the method comprising at least the steps of:

cleaning a surface of a coat layer containing a titanium oxide photocatalyst after completion of printing; and

then renewing the coat layer containing a titanium oxide photocatalyst by light irradiation thereon and an electrochemical treatment thereon.

47. The method for renewing a printing plate material as claimed in ~~any of claims 42 to 46~~ claim 42, wherein the step of cleaning the surface of the coat layer and the step of renewing the coat layer are performed in a printing machine.

~~46~~ 28. A method for renewing a printing plate material as in the printing plate material of claim ~~24~~ 21, the method comprising at least the steps of:

cleaning an outermost surface of the printing plate material including a surface of the coat layer which surface is hydrophilic in at least a portion thereof after completion of printing; and

then renewing the coating layer to cause a hydrophobic surface having a water contact angle of 50° or more to emerge.

~~49~~ 29. The method for printing plate material as claimed in claim ~~48~~ 28, wherein the step of cleaning the outermost surface and the step of renewing the coating layer are performed in a printing machine.

50. A method for preparing and renewing a printing plate

material, wherein the step of preparing a printing plate by irradiation of a surface of a coat layer of a printing plate material as claimed in claim 1 ~~or 16~~ with light having a wavelength having an energy higher than a band gap energy of titanium oxide photocatalyst, the step of cleaning the surface of the coat layer, and the step of renewing the coat layer are performed in a printing machine.

51. A method for preparing and renewing a printing plate material, wherein the step of preparing a printing plate by irradiation of a surface of a coat layer of a printing plate material as claimed in claim 24 with light having a wavelength having an energy higher than a band gap energy of titanium oxide photocatalyst to cause the above described surface of the coat layer in the irradiated region to emerge, the step of cleaning the outermost surface including the surface of the coat layer which has emerged, and the step of renewing the coat layer are performed in a printing machine.